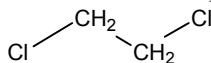


## 1,2-DICHLOROETHANE (ETHYLENE DICHLORIDE)

CAS No. 107-06-2

First Listed in the *Second Annual Report on Carcinogens*



### CARCINOGENICITY

1,2-Dichloroethane is *reasonably anticipated to be a human carcinogen* based on sufficient evidence of carcinogenicity in experimental animals (NCI 55, 1978; IARC V.20, 1979; IARC S.7, 1987). When administered by gavage, 1,2-dichloroethane increased the incidence of hepatocellular carcinomas in male mice, mammary gland adenocarcinomas and endometrial stromal neoplasms of the uterus in female mice, and lung adenomas in mice of both sexes. By the same route of administration, 1,2-dichloroethane increased the incidence of squamous cell carcinomas of the forestomach, subcutaneous fibromas, and hemangiosarcomas in male rats and mammary gland adenocarcinomas in female rats.

There are no adequate data available to evaluate the carcinogenicity of 1,2-dichloroethane in humans (IARC V.20, 1979; IARC S.7, 1987).

### PROPERTIES

1,2-Dichloroethane is a clear, colorless, heavy, flammable, oily liquid with a pleasant, chloroform- like odor. It is sparingly soluble in water and soluble in most organic solvents. 1,2-Dichloroethane is produced in technical (97.95%-98.97% active ingredient) and spectrophotometric (100%) grades. When heated to decomposition, it produces toxic fumes of hydrochloric acid.

### USE

1,2-Dichloroethane has been replaced as a solvent and degreaser by less toxic compounds. It once served as a solvent for processing pharmaceutical products; for fats, oils, waxes, gums, resins, and particularly for rubber; and in paint, varnish, and finish removers (HSDB, 1998). It was also used as an insect fumigant for stored grains and in mushroom houses, a soil fumigant in peach and apple orchards, a cleaner for upholstery and carpets, a solvent in textile cleaning and metal degreasing, a lead scavenger in antiknock gasoline, a starting material for chlorinated solvents such as vinylidene chloride, a dispersant for plastics and elastomers such as synthetic rubber, an ore flotation compound, and as an extractant in certain food processes (IARC V.20, 1979; NIOSH 27, 1978; HSDB, 1998). Therapeutically, 1,2-dichloroethane was once used as a general anesthetic instead of chloroform, especially in ophthalmic surgery (HSDB, 1998).

## PRODUCTION

Commercial production of 1,2-dichloroethane in the United States was first reported in 1922 (IARC V.20, 1979). A major industrial chemical, 1,2-dichloroethane has been ranked in the top 50 highest volume chemicals produced in the country for the past several years by *Chemical and Engineering News*. Its production has remained essentially stable, with more than 13 billion lb produced annually since 1988 (Chem. Eng. News, 1991; USITC, 1990, 1989).

Greater than 39 million lb of 1,2-dichloroethane were imported into the United States in 1989, while 1200 billion lb were exported that same year (Chem. Eng. News 1985b; Chem-Intel 1987; Chem. Prod, 1988; USDOC Exports 1990; and USDOC Imports 1985, 1988, and 1990).

## EXPOSURE

The primary routes of potential human exposure to 1,2-dichloroethane are inhalation, ingestion, and dermal contact. The greatest source of exposure to 1,2-dichloroethane for most of the U.S. population is inhalation of the compound in contaminated air, since releases of 1,2-dichloroethane to the environment as a result of industrial activity are expected to be primarily to the atmosphere. Emissions to the atmosphere comprise the largest component of all releases of 1,2-dichloroethane to the environment. The EPA estimated that in 1982 approximately 40 million lb of 1,2-dichloroethane or 0.2% of total production were released to the atmosphere from fugitive sources (e.g., valves or storage tanks), secondary sources (e.g., emissions from waste-water treatment processes), process vents and shipping operations (ATSDR, 1994-R043). The Toxic Chemical Release Inventory (EPA) listed 96 industrial facilities that produced, processed, or otherwise used 1,2-dichloroethane in 1988 (TRI, 1990). In compliance with the Community Right-to-Know Program, the facilities reported releases of 1,2-dichloroethane to the environment which were estimated to total 5.3 million lb. According to the TRI, in 1991 approximately 4 million lb (99.1% of total environmental releases) of 1,2-dichloroethane were discharged to air, 24,852 lb (0.62%) to publicly owned treatment works, 23,852 lb (0.58%) to water, and 7,051 lb (0.17%) to land. 1,2-Dichloroethane released to the atmosphere may be transported long distances before being washed out in precipitation. 1,2-Dichloroethane has been detected in not only ambient urban and rural air and in indoor samples of residences located near hazardous waste disposal sites but also in surface water, ground water, and drinking water (ATSDR, 1994-R043). EPA reported that 1,2-dichloroethane was present at concentrations of 1-90 ppb in 53 of 204 surface water samples taken near heavily industrialized areas across the United States (IARC V.20, 1979). Drinking water samples from a number of urban and rural locations in the United States have been reported to be contaminated with 1,2-dichloroethane. Concentrations in domestic surface waters used as drinking water sources have been reported to range from trace amounts to 4.8 µg/L. Concentrations in domestic groundwater supplies used for drinking water have been reported to range from trace amounts to 400 µg/L. Exposure to 1,2-dichloroethane through ingestion of contaminated drinking water is expected to be an important source for only 4-5% of the population. However, for populations with drinking water supplies containing more than 6 µg/L of the compound, this route is expected to be more important than inhalation. 1,2-Dichloroethane has also been detected in food items and in human breath, urine, and milk (ATSDR, 1994-R043).

Human exposure to 1,2-dichloroethane is expected to be highest among certain occupational groups (ATSDR, 1994-R043). The National Occupational Hazard Survey, conducted by NIOSH from 1972 to 1974, estimated that 1,350,941 workers in 111,222 plants were potentially exposed to 1,2-dichloroethane in the workplace in 1970 (NIOSH, 1976). These estimates were derived from observations of the actual use of 1,2-dichloroethane (6% of total estimate), the use of tradename products known to contain 1,2-dichloroethane (3%), and the use of generic products suspected of containing the compound (92%). The largest numbers of exposed workers were found employed

in the medical and other health services, automotive dealerships and service stations, and wholesale trade industries (ATSDR, 1994-R043). The National Occupational Exposure Survey, conducted by NIOSH from 1981 to 1983, indicated that 77,114 workers, including 32,891 women, in 1,526 plants were potentially exposed to 1,2-dichloroethane in the workplace (NIOSH, 1984). The estimates were derived from direct observations of the actual use of the compound (68%) and the use of tradename products known to contain 1,2-dichloroethane (32%). The largest numbers of exposed workers were found employed in the apparel and other textile products, chemical and allied products, business services, and petroleum and coal products industries as machine operators, assemblers, and production inspectors, checkers, and examiners (ATSDR, 1994-R043).

## **REGULATIONS**

Assessments of the compound are in progress under the authority of the Clean Air Act (CAA), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Safe Drinking Water Act (SDWA), Toxic Substances Control Act (TSCA), and Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). EPA has established a reportable quantity (RQ) of 5,000 lb for 1,2-dichloroethane, and published water quality criteria for the compound under the Clean Water Act (CWA). Under CERCLA, EPA adjusted the RQ from 5,000 to 100 lb. Under the Resource Conservation and Recovery Act (RCRA), EPA regulates 1,2-dichloroethane as a hazardous constituent of waste. Under the Superfund Amendments and Reauthorization Act (SARA), 1,2-dichloroethane is included on a list of toxic chemicals with general threshold amounts established for facilities using or producing the compound. FDA's Center for Food Safety and Applied Nutrition, under the Food, Drug and Cosmetic Act (FD&CA), labeled the compound an animal carcinogen. Through regulations and other actions, FDA is eliminating 1,2-dichloroethane residues in foods. NIOSH has recommended an exposure limit of 1 ppm ( $4 \text{ mg/m}^3$ ) as a 10-hr time-weighted average (TWA) with a 2 ppm ( $8 \text{ mg/m}^3$ ) short-term exposure limit (STEL). OSHA adopted a transitional permissible exposure limit (PEL) of 50 ppm ( $200 \text{ mg/m}^3$ ) as an 8-hr TWA, with a 100-ppm ceiling and 200-ppm maximum peak concentration for 5 minutes in any 3-hr period; OSHA adopted this standard for toxic effects other than cancer. The OSHA final rule PEL is 1 ppm 8-hr TWA with a 2-ppm 15-min STEL. OSHA also regulates 1,2-dichloroethane under the Hazard Communication Standard and as a hazardous chemical in laboratories. Regulations are summarized in Volume II, Table B-41.